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POLYTHENE COMES OF AGE

By F. M. S. Harmar-Brown

The discovery of polythene is one of the major achievements of I.C.I. research. This outstanding plastic, remarkable for its properties of electrical insulation, is now made under licence the world over, bringing in royalties to the tune of over £3m. a year. Here, for the first time, is told the story of how polythene was discovered and how it is made.

THE year is 1933. King George and Queen Mary have seen their first talking film—*The Good Companions*; Amy Johnson has flown from England to Cape Town and back in eleven days and has been awarded the Segrave Memorial Trophy; Baillie-Stewart is on trial for treason; Roosevelt has defeated Hoover and become President of the United States; Hitler has been elected Chancellor of the German Reich; Hyperion has won the Derby—and, seated at his bench in the "Corner Lab." in the Research Department of the Alkali Division, one R. O. Gibson writes of his latest experiment: "white, waxy solid found in reaction tube."

That was twenty-one years ago, and the white, waxy solid was the world's first sample of polythene, perhaps the most remarkable plastic ever made.

It is now well known how I.C.I.'s first full-scale polythene plant came into commission only six years later—simultaneously with the outbreak of war—and how, by making airborne radar practicable, polythene played its significant role in helping to win the war. It is also well known that, since the war, polythene has proved its exceptional worth in innumerable uses—from submarine cables to scent bottles, and from food bags to cold-water tubing. This amazing material—like ultra-tough candle wax—celebrates its twenty-first birthday in fine fettle with a great future before it.

But if the story of polythene during and since the war is well known, very little has been written on the events that led up to Fawcett and Gibson's epoch-making experiment, and even less on the wonderful engineering achievement that has made it possible to produce polythene in bulk.

The long chain of events behind the discovery of polythene stretches back as far as we care to travel, since every event has a cause somewhere. But a good point to join the trail is 25th September 1907, when Dr. F. A. Freeth (who retired from the Company's service only recently), redoubtable even as a young graduate from Liverpool University, might have been observed restraining a small handcart full of apparatus as he descended the hill to Winnington Works on his way to take up his appointment in the research laboratory of Brunner, Mond & Co. Ltd.

A catalyst is a substance that enables a chemical reaction to proceed, though it takes no part in it, and it is probably fair to say that Freeth was the catalyst in the human reaction that culminated in polythene. A description of all the threads in the complex web of activity that led up to this discovery would read like the programme notes of one of the more involved operas; it would cover half Europe and include a score of names that have since become household words in the world of science or industry. Here we can follow only the main threads in the story.

On, then, to December 1919. At this time Brunner Mond were taking the first steps to establishing the high-pressure ammonia plant that has since grown into Billingham Works. The low-temperature distillation of gases, which involves high pressures, was a promising new technique, and it was natural for Freeth—by this time Research Manager—to visit Leyden University in Holland, where the famous Kammerlingh Onnes was investigating the behaviour of gases at low temperatures and high pressures.

From then until 1931 Brunner Mond's connection with Leyden was continuous and fruitful. In 1924 Freeth took on J. C. Swallow (now, of course, chairman of Plastics Division), who had been on a post-graduate course at Leyden; and in 1926 he took on R. O. Gibson in the same way. Moreover, it was while Gibson was at Leyden that he met Dr. Michels of Amsterdam, and thus eventually, in 1931, we find collaborating with Michels both Gibson and another Brunner Mond man, M. W. Perrin, later to become well known for his work on the atomic bomb. Assisted by an I.C.I. grant, they studied the behaviour of gases at a pressure of 50,000 lb./sq. in., which was far higher than anything then used in industry. Other members of the Winnington research team at this time who were to play their part in the polythene story were E. W. Fawcett, W. R. D. Manning (an engineer) and E. W. Colbeck (a metallurgist).

High Pressures at Winnington

Accordingly, in February 1931, when Gibson returned from Amsterdam he started off on high-pressure research. At much the same time E. W. Fawcett, originally a Winnington chemist, but transferred later to the Dyestuffs Division, was seconded back to Winnington to act as a liaison between the Winnington high-pressure research team and the Dyestuffs Division Research Committee. Thus in 1933 we find Fawcett and Gibson, at Professor Robinson's suggestion, examining the possibility that very high pressure would produce a reaction (in which Dyestuffs Division were interested) between benzaldehyde and ethylene gas.

On 27th March 1933, Fawcett and Gibson carried out the experiment that yielded the "white, waxy solid." When this was analysed it was found to contain no oxygen, and it was therefore concluded (rightly) that the substance contained no benzaldehyde and was simply a new form—a *polymer*—of ethylene. A day or two later they repeated the experiment, but there was "an explosion which shattered the gauges." Further experiments resulted in further traces of the polymer, but also in another explosion and a fire, after which ethylene was declared an unsafe gas and work on it was suspended until superior equipment and safer accommodation were available.

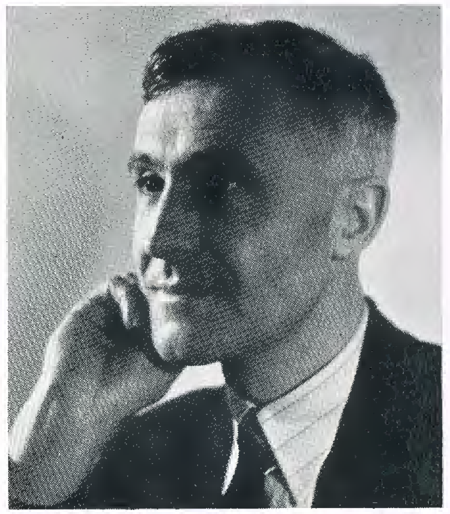
The Vital Experiment

By the autumn of 1935, Vigars, Manning and Colbeck had developed the equipment, and a safe location was available in the laboratory that had formerly been used for high-pressure research for Billingham on the hydrogenation of coal. The ethylene pressure in the sturdy reaction vessel was raised to the staggering value of 30,000 lb. per square inch—about the same as that in a 15 in. naval gun at the moment of firing. The experiment was a complete success, and 8 grams of the first polythene to be made in the new and specially designed apparatus saw the light of day on 20th December 1935. The team was the late J. G. Paton, E. G. Williams (now Research Director of the Plastics Division) and F. Bebbington as assistant.

Early in 1938 Mr. J. N. Dean of Submarine Cables Ltd. learned about the new plastic (by reading the report of Lord McGowan's speech at the Annual General Meeting of the Company) and after examining a small sample recognised its potential value for insulating high-frequency and submarine cables. Following some preliminary

THESE MEN MADE POLYTHENE POSSIBLE

BEBBINGTON
assistant in polythene team



COLBECK
specialist in metallurgy

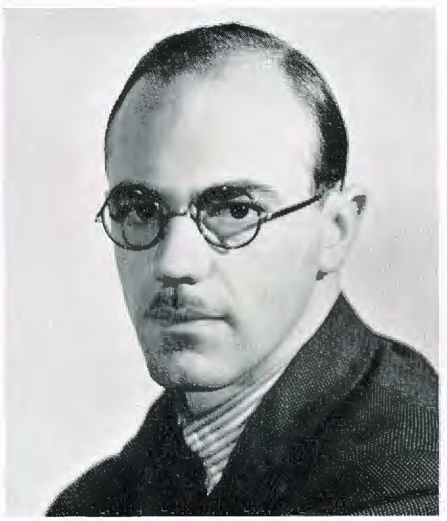
FREETH
the human catalyst

GIBSON
first man to make polythene

MANNING
solved engineering problems

MICHELS
Amsterdam high-pressure expert

ONNES
Leyden University physicist



PERRIN
studied high-pressures in Amsterdam

WILLIAMS
his team made the first 8 grammes

small-scale tests made in collaboration with the Post Office, I.C.I. were asked if they could deliver 100 tons of polythene for two Scotland–Norway cables by the middle of 1939. Later, as an outcome of a further—and this time full-scale—trial of a length of cable, this quantity was raised to 150 tons, for delivery during the twelve months beginning February 1939.

This was real business at last. Plans were made immediately to hasten the completion and to double the capacity of the first plant, whose erection had been decided on in the summer of 1938 on the basis of sales estimates for various uses, much the largest of which was submarine cables.

As it happened, of course, the cables for which this polythene was intended were never made, because as soon as the war began the precious material was switched to the production of the ultra-important high-frequency cables for radar, or R.D.F., as it was then called, and for the control of minefields. Thus it was not until 1944 that the first important polythene-insulated telephone cables were laid across the sea—in June 1944, to Normandy.

The story of polythene's progress has often been told and need not be repeated here. But what a far cry it is from the solitary scientist of fiction, making earth-shaking discoveries overnight, to the progress of invention in reality! Even in this quick summary of the discovery of polythene we have had to mention Onnes, Freeth, Swallow, Gibson, Michels, Perrin, Fawcett, Vigars, Manning, Colbeck, Paton, Williams and Bebbington, and these are but a few of those without whom polythene might never, or not yet, have become the household word that it is today.

Simple Chemistry

There is nothing difficult in theory about the manufacture of polythene. You take ethylene, which is a gas somewhat similar to, say, acetylene except that the carbon and hydrogen atoms are joined by double links instead of treble ones. And you bump the pressure up to something like 30,000 lb. per square inch, after which, all being well, the carbon and hydrogen atoms, originally arranged in pairs, suddenly polymerise into huge chains, many hundreds long, and form ethylene polymer, poly-ethylene or polythene for short. It is only in practice that the snags occur.

The first and major snag is the sheer magnitude of the pressure needed—a pressure that would burst one of those strong steel oxygen or acetylene cylinders as if it were a paper bag full of gunpowder. Second, once the reaction starts it develops heat, and if the heat is not removed quickly enough, what began as a controllable reaction finishes as an uncontrollable explosion. Third, the reaction is helped along by a catalyst, but too much of this may cause an explosion by making the reaction too fast.

So formidable are the problems of engineering and control that somebody once said, perhaps not very seriously, that in making polythene I.C.I. had achieved the impossible. That this "impossible" process is now working smoothly and on a very large scale is a glowing tribute to Alkali Division's research chemists, metallurgists and engineers, whose skill and expertise have culminated in the huge new polythene plant recently started up at Wilton.

Ethylene from Wilton Cracker

The ethylene gas, which is the starting point of the process, is supplied by the nearby Olefines Plant, operated at Wilton by Billingham Division. It is the chief of the gas and liquid products that this plant produces by "cracking" a petroleum product similar to paraffin and separating off the various resulting components by distillation at low temperatures.

The ethylene gas for the polythene plant is stored under slight pressure in two huge gleaming silvery spherical tanks. The Olefines Plant at Wilton now also supplies the ethylene for the Winnington polythene plant, but in this case the ethylene is sent to Winnington in specially lagged road tankers as a very cold liquid. The procedure at both the Winnington and Wilton polythene plants is similar. There are, of course, differences in detail, but since detailed know-how on the manufacture of polythene is still a very valuable commodity we shall have to confine ourselves here to only a general description of the process.

The first stage is to take the ethylene gas and compress it to about 5000 lb. per square inch. Not so very long ago even this would have been regarded as a fairly unmanageable pressure—it is about as high as that used in the ammonia plant at Billingham. On the polythene plant, however, it is merely the first step. Towering four-cylinder vertical compressors, electrically driven, suck in the gas and raise it to this pressure in four stages.

Fourteen Tons per Square Inch

Now comes the high-pressure part of the process. Here the ethylene, although still a gas, is beginning to become very dense and incompressible, and it can be raised to the enormous pressure of 14 tons per square inch in a further single stage. This enormous squeeze is carried out in specially built vertical compressors. At this stage the high-pressure gas needs only heating and a little encouragement in order to turn into polythene.

The major technical achievement of the process is to persuade this conversion into polythene to occur in the right place and at the right speed. In principle this is simple. The high-pressure gas is led by pipeline into convertors. These convertors, as strong as gun barrels, are mounted in the open air and surrounded by thick

(*Continued on page* 267)

One man and his job—22

EXPLOSIVES EXPERT

(Reprinted from *John Bull*)

STOOPING under the low roof, John Hancock, a mining engineer and explosives expert, was walking along the coalface of a mine in the Midlands when he heard voices round the next corner. At the same time he saw a long yellow cable that came round the corner and led to detonator leads sticking in the coalface beside him.

"I've never moved faster in my life," says Hancock. Believing that there was nobody in the danger area, the men were just about to fire the charge of high explosive when Hancock stumbled round the corner. "The shotfirer nearly collapsed. Shotfiring regulations state that every approach must be guarded. But the road I came along had been overlooked."

As manager of the technical service department of Nobel Division in Glasgow, Hancock's job is to advise industry on the safe and efficient use of explosives. He is in charge of twelve mining engineers and ten explosives demonstrators, who are ready to undertake any explosives job at a moment's notice—often abroad—in mines, quarries and oilfields. "Nowhere in the world," he says, "is there more knowledge of the use of explosives than in this department."

In his twenty-four years with the department Hancock has handled jobs needing anything from a few ounces to many tons of explosive. He can gauge the exact type and amount of explosive needed for every job.

Much of Hancock's work is in quarries, where 100,000 tons of rock are often shattered with one push on the exploder handle. To bring down this amount of rock the quarrymen drive a tunnel 4 ft. 6 in. in diameter a distance of fifty feet into the quarry face, then turn right and left to drive a cross-tunnel parallel to the face. Four chambers 6 ft. square are hacked in the sides of this cross-tunnel, and two tons of explosives are packed in each chamber. The tunnels are then "stemmed" with a packing of stone and turf before the charges are detonated.

Hancock prepared his first big blast of this kind at a quarry in Lancashire. He had packed the chambers with explosives and fitted a 'Cordtex' fuse, which has a high explosive core that burns at 22,000 ft. a second. He was stemming the tunnel when he smelled burning. He went further inside, sniffing. "Today I would just run for it," he says. He could see no smoke, so he hurried to the tunnel mouth. "There, in the quarry, was a steam-driven excavator—puffing clouds of smoke!"

After a Clydeside dock had been extended, Hancock had the job of demolishing a wall of the old dock. A cruiser lay seventeen feet away. When a naval officer worried about his ship's safety, Hancock replied: "I thought cruisers were built to take a battering."

"Just you scratch our paint, that's all!" threatened the officer.

The wall—120 ft. long, 40 ft. high, and in places 14 ft. thick—was demolished in five weeks. "We didn't scratch the cruiser's paint," says Hancock. "We hung a screen of railway sleepers on a crane between the wall and the ship."

Hancock's staff are often asked by the police to remove explosives from safe keyholes when burglars have been disturbed before they could blow the lock. The safe robber usually presses gelignite into the lock, stems the keyhole opening with soap, and then fires the shot with an electric detonator by attaching the detonator wires to a torch battery. One young engineer turned out recently to such a safe. As he pulled out the soap stemming, a wisp of smoke floated out. But he stayed on, and dug out the explosive with a spatula. Later he gave the soap to an I.C.I. chemist, who discovered the reason for the smoke. Short of soap, the safe-breaker had added some powder he found lying on the floor of the office. The powder was rat poison containing phosphorus, which had acted on the moisture in the soap, causing it to steam.

When the *Queen Mary* was about to be launched, the Clyde had to be deepened by removing some five feet of whinstone from the river bed. Contractors had pounded the river bed with a power-operated pile-driver. Finally they were left with a number of four-foot "pimples," and the pile was slipping off them at every blow.

Hancock went down in a diving bell and blasted the lumps of rock with explosives. "The bell was open at the bottom, and we sat on a form. My ears felt as if they were being pricked by red-hot needles. We stood in an inch of water on the bottom of the Clyde while we drilled a hole and put in the explosive. I was spitting blood. Then I lit the fuse, telephoned to the top, and we were brought up quickly."

In the afternoon Hancock found unusual difficulty when he was on a routine job of climbing 150 ft. up a quarry face. That evening his doctor told him that he had a touch of the bends—divers' disease. His blood had become full of nitrogen bubbles from being raised too quickly from the river bed. He was ill for a fortnight.

It is an adventurous job, but one that could only be tackled by a man with unusual qualifications. "To be a technical service engineer," it has been said, "you must be a good mining engineer, have a university degree, be a practical man, a lecturer, a diplomat, be able to live at the Savoy or with Peruvian Indians, work 16,000 ft. above sea level or 3000 ft. below ground, speak Spanish, sew on buttons, darn socks and ride a horse."

John Hancock

Information Notes

MY FIRST METEOR FLIGHT

By Timothy Morris

Timothy Morris, aged 18, is the son of the Alkali Division Home Sales manager. Recently he won an R.A.F. scholarship worth £150, and here is the vivid account of his first Meteor flight which he wrote home to his parents.

BY 12 o'clock we were on the aerodrome, watching a bloke showing off in a Meteor 7. He dived vertically towards the airfield and at the last moment, less than fifty feet above the airfield, flattened out upside down. This was, so to speak, the curtain-raiser to my own flight. I did not have to wait long before donning a Mae West—an inflatable jacket to keep one up in the sea (not very encouraging!)—a flying helmet, goggles, and a parachute that seemed to weigh a ton. I had to sit on the parachute on the tarmac while an aircraftman did up the straps and (since I could not find it) probably the ripcord as well.

Meteor Mk. VII

I then clambered into the navigator's seat and sat on my parachute. The flying helmet took a bit of getting used to. It consisted of an oxygen mask with a microphone inside and earphones in the helmet, plus goggles. The intercom and the oxygen feed were connected up and the cockpit cover clamped down with a certain finality. The engines passed from a high-pitched whistle to a roar, and we taxied to the end of the runway.

I found that I could not hear the pilot at all, but by fiddling with a faulty plug I finally got the juice through. By that time we were half-way down the runway, and the pilot, thinking the fault to be permanent, slammed on his brakes; but by then I could hear him clearly.

We then taxied back to the end of the runway and prepared to take off. The pilot asked me where I wanted to go, so I said Scotland. Right, he said, and slammed both throttles right forward. We shot down the runway at over 130 m.p.h. and at that speed became airborne. I felt the straps that held me in my seat getting tighter every moment. It was the incredible acceleration which forced one right into one's seat and made movement of fingers impossible. We climbed to 10,000 ft. with the most perfect views all round—a predominantly brown countryside, with strips of snow in the shadow of hedges and a lot of water in the valleys reflecting the blazing sun.

It took us just over two minutes to cover the twenty miles to Shack* in what must surely be the most comfortable way of travelling. The sound of the twin jets was left miles behind, and the speed smoothed out any bumps there might have been. Over Shack we did some tight turns—just to get used to the sensation, the pilot said. We set course for the coast, which soon came into view, and reduced height to 2000 ft. Once over the sea we came down very low and flew along the cliffs past Whitby and Scarborough.

An iron-ore ship which had run aground last winter appeared dead ahead, and after the pilot had put the wings into an almost vertical plane both to port and starboard so that I could see better, we dived straight at the ship. The faster we went the louder the pilot's singing on the intercom became. We levelled off above the ship at about fifty feet and continued flying low to avoid the stench of Middlesbrough. Needless to say, even jets flying at 500 m.p.h. cannot escape that. Happily the acrid smell in the cockpit soon passed and so too did Newcastle on our port with several ships standing out from the mouth of the river awaiting the tide.

Just south of Berwick we turned north-west and set course for Edinburgh. The vast stretch of the Firth of Forth reflected the sun in the far distance. The lowland hills were capped in snow. They soon dropped behind us and the spire of St. Giles came into view. Since taking off we had been flying for twenty minutes.

The pilot suggested that we should do some aerobatics. I grudgingly agreed, expecting considerable discomfort. Over Edinburgh we climbed to 20,000 ft. and set course in thick cloud for Northern Ireland. The pilot said we should need at least 520 knots to do three loops. I was not amused, since the reduced pressure hurt my ears considerably.

The aircraft went into a steep dive, and without any warning at all the pilot pulled the stick right back and shot vertically upwards. Instinctively I closed my eyes as we went over on

* Ampleforth College

our back to dive down again. He did this three times, singing all the time, while I attempted to collect not only my bearings but my thoughts as well. It was a peculiar sensation, reminiscent of falling off a cliff in a dream, spiralling down and yet feeling upright.

I was a little disconcerted when I saw the Irish sea vertically above me. We continued diving towards the Irish coast, the mach meter at one point reading 0·85—the speed of sound—and sighted a rocky coast before turning east across the sea and the Lake District. Here the scenery seemed extremely barren, great jagged rocks capped by snow rising out of the brown moorlands and here and there a green valley, partly filled by a reservoir or lake, with a cluster of houses every so often beneath the hills.

We talked about Farnborough and what my pilot's job was previously and what his present job was. Then I began to feel drowsy. It must have been the oxygen, which seemed far more pleasant to breathe than ordinary air.

Over the Pennines we picked up another night fighter and waggled our wings. Then the orders of the control at Leeming crackled in our headphones as they directed us in. We came in over the hedge at 125 knots and touched down with the nose up. Gradually the plane came down as we reduced speed. It took one and a half miles of runway to knock down the speed to 10 m.p.h.

The pilot opened the hood and I slowly began to register what was happening. We taxied back to our position outside the hangar and dismounted. It took some time to get used to walking on concrete again. Apart from pains in my ears I could not have enjoyed the flight more: it fulfilled all my aspirations. I had lunch in the officers' mess with the pilot, who was an awfully nice chap.

RE-LEARNING TO READ

By Rex Strayton (Assistant Education Officer, Metals Division)

A recurrent complaint of management is that there is too much to read. One solution is to read faster. At Metals Division twenty senior executives, including five members of the Division board, have been on a reading improvement course based on films lent by Harvard University. Their reading efficiency improved by 40%.

IN our time we have all been taught (and some of us have learned) the "three R's." Since then, more and more of us have had to do more and more reading to keep pace with the 'riting and 'rithmetic produced by other people.

In the worlds of industry and commerce this has become a real problem; over the past few years the volume of paperwork in circulation has grown enormously, and attempts to cut down its quantity or improve its quality have met with only limited success. It seemed, therefore, that the only hope was to tackle the problem from the other end, and some twelve months ago Metals Division Education and Training Department was posed a question. Was it possible that training in faster reading could restore to executives precious hours which could be devoted to more productive and more important work?

. . . posed a question

We started to investigate, and since little or nothing had been done about it on this side of the Atlantic, most of our enquiries were directed to the U.S.A. Some startling information came to light. Reading improvement programmes were, it appeared, being run there in three hundred colleges and universities and countless private firms; results achieved showed increases in reading speeds varying between 65% and 115% with no loss of comprehension.

The evidence was so persuasive that towards the end of 1953 I.C.I. bought a set of the training films used in Harvard University, arranged for other necessary equipment to be designed and made in the Metals Division and, in the New Year, inaugurated what was probably the first Effective Reading Course in Europe. There were twenty "students"—five members of the Division board and fifteen members of senior management; split into two groups, they embarked on a course consisting of sixteen sessions of 75 minutes each, to be spread over eight weeks.

Apart from a diagnosis of the obstacles to faster reading (small eyespan, looking back over the text, "inner speech," limited vocabulary, lack of confidence and so on), almost all the time was spent in practical work. Every session started with one of the Harvard reading films, which served among other things as a pacing device. Film No. 1 set off at 180 w.p.m. with five "fixations" a line (i.e. only one-fifth of each line of text was illuminated at a time). As the course went on, the speed of the films increased progressively while the number of fixations decreased. Film No. 16 had to be read at a speed of 470 w.p.m. with only two fixations a line.

Immediately after each film the members of the course were given a selected reading of about a thousand words in length, in order to transfer to the normal reading situation the skill developed by means of the films. Both the films and the selected readings were followed by tests of comprehension, each consisting of ten multiple-choice questions demanding knowledge of both details and main ideas, and requiring certain inferences to be drawn.

Variety was introduced with skimming exercises, précis writing and other tests done against the stop-watch. These were designed to overcome one or other of the obstacles to

faster reading, to introduce a sense of urgency, or to develop confidence in the power of the eye and brain.

Every session from No. 5 onwards included about ten minutes' training with the tachistoscope, which seeks to increase eyespan and speed of perception by exposing longer and longer groups of numbers or words for shorter and shorter periods. In session 16, for example, the members of the course were required to read phrases consisting of twenty-four type characters in one-fortieth of a second—and, incidentally, found this well within their capabilities.

An important item in the programme was the maintenance of individual score sheets, which gave the opportunity for constant self-assessment and provided a stimulus to further effort. The most important part of this showed three graphs relating to the selected reading—one of reading speed, one of comprehension, and a combination of these as a reading score.

On the basis of initial and final tests only, the average reading of the group rose from just under 200 w.p.m. to about 355 w.p.m.—an increase of 80·6%. For those who, like the instructor, feel diffident about basing net improvement figures on initial and final tests, a second set of figures revealed that, judged on an average of sessions 2 and 3 and sessions 12–15, the net improvement registered by the group was 40·7%. These increases were achieved with no loss of comprehension; the highest individual reading speed—555 w.p.m.—was in fact accompanied by 100% correct answers to the questions.

Clearly it would be unwise to argue from these limited data that by means of this course the time spent on reading in I.C.I. can be halved. Indeed, the point was repeatedly made that, to be truly effective, reading must be flexible, so that speed can be related to the style of the material and the purpose for which it is being studied. But the fact remains that, in the short space of twenty hours, members of the course were persuaded to discard reading habits acquired in and never altered since childhood and to achieve a welcome degree of confidence in the capacity of eye and brain.

We shall await with considerable interest reaction in other Divisions of the Company.

PLASTICS IN THE ATOMIC PILE

By Dr. A. H. Willbourn (Plastics Division)

It was recently discovered that certain plastics undergo considerable change if subjected to atomic radiation in an atomic pile. For instance, polythene so treated instead of melting at 115° C. becomes transparent and rubbery. The possibility that this development might have limited practical applications is here discussed.

The possibility of using atomic nuclear reactors to produce desirable changes in the properties of certain plastics has recently been a subject of speculation in the press—some of it rather wide of the mark. The actual position is roughly as follows.

At the Atomic Energy Research Establishment at Harwell not long ago Dr. A. Charlesby had occasion to examine some pieces of polythene which had been in the atomic pile and which had obviously undergone a drastic change in properties. He found that after about three weeks in the pile polythene changes from being an opaque, semi-crystalline, flexible substance to a brown, transparent, brittle glass.

. . . a cross-linked network . . .

Dr. Charlesby also discovered that the main effect of this atomic radiation treatment on polythene is to produce chemical linkages between the molecules to an extent proportional to the time of exposure in the pile. Quite a small "dose" of this very concentrated treatment is sufficient to join all the molecules in a piece of polythene together in one vast cross-linked network: the polythene is thus "vulcanised" and rendered completely insoluble without the addition of any chemical. Such small doses of radiation result in no obvious change in the appearance of polythene, but they do profoundly affect its behaviour on heating. Instead of melting to a viscous liquid at about 115° C. it becomes transparent and rubbery and does not flow at all.

Larger doses produce a stiffer "rubber" at high temperatures, as the molecules become joined together at more and more points: finally, after a three weeks' dose, brittle glass is produced.

This was a fascinating discovery. Attention was quickly given to other long-chain compounds, including natural products as well as plastics and rubbers, which might be expected to behave in a similar way to polythene. It was found that the main effect in many cases was to produce cross-links between molecules. This was the effect with polystyrene, nylon, gutta-percha, neoprene, polyvinyl chloride and natural rubber. On the other hand, some materials, including 'Perspex,' polyisobutylene and 'Fluon,' were degraded. Even some of the materials which became cross-linked tended to be degraded in various ways. This is particularly so if the irradiation is done in air; polythene, for instance, becomes heavily oxidised on the surface under such conditions.

The Plastics Division is of course very interested in any new tricks which can be played with plastics. We have followed these developments with great interest and are collaborating with Harwell in certain aspects of the work. Dr. Charlesby and his colleagues have already published some of the results of their work in scientific journals, and there have been articles in the technical and commercial press.

The subject really came to the notice of the public, however, in a Sunday newspaper report, where it was suggested that these discoveries might lead to the birth of a new branch of the plastics industry and to a revolution in the rubber industry: tyres would be vulcanised by gamma rays instead of chemicals! It was also suggested that British companies were lagging behind in their appreciation of the significance of these effects while American industry was about to exploit them in a really big way.

The true position is rather less sensational, but it has possibilities. The discovery of this new technique of cross-linking in plastics opens up some very interesting fields of research, and it is possible that there will be limited technological applications. The prospects for the latter have become rather brighter with the discovery that an atomic pile is not necessary to produce these effects. It appears that almost any form of radiation, if it is of sufficiently high intensity, will serve. Thus, X-rays from ordinary X-ray machines and gamma rays from radioactive elements are both effective.

The General Electric Company of America have used the high-energy electron beam from a million-volt X-ray machine to produce the same results as were obtained at Harwell in the atomic pile. They are reported to be considering the application of this technique to the treatment of polythene articles such as bottles for pharmaceuticals and blood-plasma. A polythene bottle with molecules cross-linked by this treatment can withstand steam sterilisation much better than one made from ordinary untreated polythene.

Clearly, however, this cross-linking process can only be applied to fabricated articles in their final form, since once the polythene is cross-linked it can no longer be moulded. Moreover, even though a polythene moulding will retain its shape at higher temperatures when it has been cross-linked it has no great mechanical strength, and it is still subject to the normal processes of oxidative degradation which become more serious the higher the temperature.

There are therefore considerable difficulties ahead in making use of the novel properties conferred by cross-linking, quite apart from considerations of cost and the difficulties associated with carrying out the operation. Electron beams would probably be relatively easy to handle once suitable equipment had been devised, but they have no great penetrating power. Radioactive materials of adequate intensity would present formidable handling problems, while an atomic pile is out of the question —at least at present!

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POLYTHENE COMES OF AGE *(continued from page 261)*

concrete walls. They are so designed that they can be heated or cooled at will, and each is fitted with a specially designed and very complex safety valve so that the gas can escape to the atmosphere if the reaction gets out of control. The compressed ethylene and catalyst are fed into the convertor, and, by very delicately altering the amount of cooling and the rate at which polythene is drawn off, the conversion is made to take place as a controlled and continuous process.

Not all the ethylene is converted into polythene, and a mixture of liquid polythene and ethylene gas is let off through a complicated and sensitive control valve at the end of the convertor. At this point the unconverted gas is led back to the compressors once again and the polythene is released at atmospheric pressure. It is extruded in the form of a thick film looking like a tough white, flexible belt of wax. The belt is passed over rollers, water cooled and granulated.

At regular intervals samples of the polythene granules are converted into strip which is tested for uniformity, while further samples are melted and tested for viscosity. The results of these tests are passed back to the processmen and give them the continual information that they need in order to keep the process producing polythene of the required high quality. The polythene granules are then whisked by an air blast at something like 100 miles an hour through a long pipeline to the blending and packaging warehouse, where they are stored and packed for despatch in bags and drums.

I hope no one thinks that, armed with this simple description of what is in essence a simple process, he can go away and build a polythene plant for himself. A full and detailed compendium of all the technical information needed to make a working polythene plant has been compiled by the Alkali Division into what must be one of the most expensive books ever published.

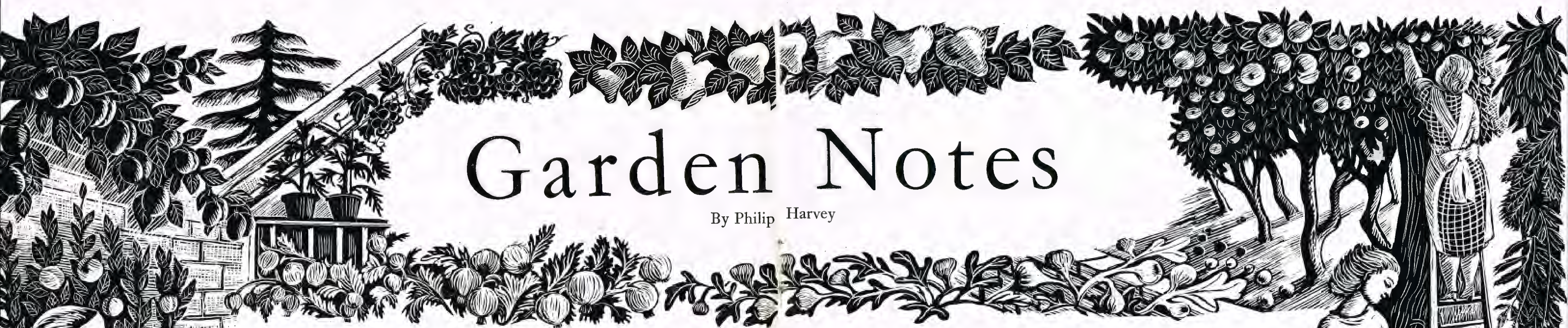
Several well-known American companies have bought this information and are now building polythene plants of their own. In addition, other companies have merely acquired licences from I.C.I. to manufacture polythene and have built their plants the hard way. Some idea of the difficulties involved may be gathered from the report that during the first few months of its operation one independently built plant produced a ton of scrap steel for every ton of polythene.

All polythene now made anywhere is produced under licence from I.C.I. Royalties from these licences and from the sale of I.C.I.'s polythene know-how have now totalled over £3m. and this figure is expected to be greatly added to in future. As a substantial proportion of the royalties comes from the United States, I.C.I.'s research achievement has resulted in a big source of dollars for Britain.

But polythene is not only made on both sides of the Atlantic: it is also to link them. For Alkali Division's polythene has been chosen to insulate the first transatlantic telephone cable. Soon many hundreds of tons of polythene will be used to carry numerous simultaneous telephone conversations by a route that, unlike the radio link now used, will never suffer from fading or atmospherics. And this new wonder has been made possible only by the unique combination of chemical, mechanical and electrical properties found in a plastic that, twenty-one years ago, was not even a dream.

Of I.C.I.'s polythene about one-third goes into electric cables, about one-fifth is made into film, another fifth goes into moulded products, and the remainder goes into tubing and miscellaneous products. Polythene is still in its infancy; there is a huge potential market for it and great possibilities in the development of special grades and forms of polythene for new applications.

It is also likely that great improvements will be made in the manufacturing process, although the experts believe that to produce the type of hard, tough, flexible polythene that the market demands, very high pressures will always be essential.



Garden Notes

By Philip Harvey

Illustrated by Zelma Blakely

On light, well-drained soils September and October are ideal months for moving herbaceous perennials. If your land is heavy and poorly drained (especially where water tends to lie on the surface during winter), wait until early March.

Experts are by no means unanimous about this question of early autumn planting, but in my experience it is far better to get the plants started where the soil is light and sandy, as cold, drying March winds, coupled with drought, hinder the growth of newly planted perennials. Heavy soils usually contain a fair reserve of moisture, and for this reason spring planting is probably best, as there is little check to growth.

I have written the above paragraph with some misgivings because I propose to disregard my own advice to others and plant some herbaceous perennials this September and October on decidedly heavy ground with some clay in the subsoil. This is, however, in the nature of an experiment, and I may well be unlucky.

There are some plants that are best moved in spring, irrespective of soil, and many nurserymen winter them in frames, refusing to sell in autumn. They include the Amellus group of Michaelmas daisies, comprising varieties like the violet-blue King George and the soft pink Peach Blossom; *Anemone japonica*; most Campanulas, Echinacea, Gypsophila, Heliopsis, Kniphofias or Red-hot Pokers, Pyrethrums and Scabious.

Replanting old clumps of border plants in their entirety is usually inadvisable, as the centre portions are hard and worn out and will seldom produce strong shoots for the following summer. Burn these portions, retaining only the young outer growths. This may seem wasteful, but with plants like Michaelmas daisies and heleniums, which make a mass of shoots in any reasonably good soil, it is useless transplanting *en bloc* and expecting first-quality blooms from every growth. Do not use a knife unless you are dealing with plants like delphiniums and peonies, which make firm crowns. The best way is to divide the plants by hand or, in the case of extra tough, woody clumps, separate the growths by means of two forks or spades back to back.

Always spread the roots out when replanting and work some fine soil or peat round them. It is advisable to incorporate a generous supply of organic matter, such as compost or hop manure, in both the top and second spits, particularly if you are planting in ground which was previously occupied by other flowers. Even if a particular plant has only been in the ground for a couple of years it will have probably taken a good deal out of the soil.

Textbooks are apt to be idealistic and recommend planting only in groups of three to six of one variety. Words like drifts and clumps are often mentioned quite casually, as if there were no limit to the size of one's garden or one's pocket. Ignore them. One plant of each variety, provided it *is* a good variety, is perfectly satisfactory, and enables anyone with restricted space to achieve a good general effect.

Do give your plants plenty of room. It is obviously impossible to prescribe any general planting distances, but never be afraid to leave a generous portion of bare earth. This will enable you to enjoy your plants as individuals. Better a dozen widely spaced herbaceous perennials than three dozen crowded together, probably with many smallish, mediocre blooms.

Unless you are on chalk, lupins are ridiculously easy to grow well. On rich ground they may flower themselves to death after two or three years, and ideally a rather poor, slightly acid soil should be chosen. There is certainly no need to work in farmyard manure. The colour range of the well-known Russell lupins is astounding. Among the more expensive varieties the deep yellow Tom Reeves, the terra-cotta and yellow Fred Yule and the pale cream Alicia Parrett are specially fine. I am particularly fond of Heather Glow, a deep wine purple. Several plants of this variety viewed at a distance suggest a bed of purple heather (the comparison is not original, I fear). Heather Glow is inexpensive and has not been surpassed by any of the later, higher-priced introductions.

The secret of growing good delphiniums is a deep, cool soil with ample organic material. Mulching with peat or leaf mould in late spring and summer will conserve moisture and is essential for first-quality spikes, as the delphinium must never be allowed to become dry at the roots. On a light soil I prefer to plant as early as possible.

Present-day delphiniums bear no relation to the old-timers. Form, purity of colour and spacing of individual florets on the spike, are almost perfect. One of the best of the cheaper varieties—which is, incidentally, long lasting when cut—is the bright blue William Richards. The word bright is perhaps inadequate, as catalogues describe the endless shades of blue as electric, gentian, cornflower, Reckitt's blue, French blue, azure and so on. The amazing thing is that all these blue varieties are really distinct.

The Flexible Laboratory

By Paul Reilly (Council of Industrial Design)

Flexibility is the keynote of the new laboratories at Plastics Division. The size of the rooms and the layout of the benches are as adaptable as a child's building bricks—thanks to an ingenious system of 'Holoplast' panels and accessible piping of services.

"MIND you," said my guide as we approached the new Plastics Division Research Laboratories, "they are partly traditional and partly contemporary." The phrase suggested some half-baked architectural hybrid, but was, as it turned out, as good a measure of progress in current building practice as one could wish. At Welwyn the words are used not to describe schools of architectural thought but simply methods of construction, since the architecture is all of this day and age. The laboratory block is a lattice steel structure lightly clad with prefabricated, removable panels; the administration wing is traditional only in the sense that bricks and mortar and normal site labour were employed.

Welwyn Laboratory seen from the railway

So far only one laboratory block of the four projected has been built; when the whole is completed the plan will look something like two H's or perhaps one large H with two connecting bars (the administration wings), but enough is already built to give a good impression of the scheme.

The first impression is that there is nothing pretentious about the building. It is a clear, straightforward essay in modern industrial architecture, neither bleak and cumbersome nor coyly mannered; it reflects too the long period of preparation and of prototype experiment that preceded the actual planning; it looks like a building designed to do a particular job by the most economical means—a sound enough formula for good design in any field.

A few hundred yards away stands another I.C.I. building, built by some previous generation on apparently opposite principles, a thoughtless, ungainly, ramshackle structure which from all its alterations and additions would seem never to have been designed for a particular job and thus never to have been well suited to any; it remains an eyesore and a tale of lost opportunity thrown into sharp relief by the conscientious, elegant effort of our own generation. For, like many new buildings today, these new laboratories are elegant—elegant almost in the sense of well dressed, being modestly and purposely tailored with a classic line and finish that should stand the test of time.

The general exterior colour scheme—chocolate panels divided by strong white mullions—is attractive but unobtrusive. In spite of there being so little conscious (and, thank goodness, no self-conscious) architecture, the block and its adjacent wings are architecturally distinguished, clear cut in volume and quite sensitive in detail.

But there is far more to these buildings than meets the eye. The Welwyn laboratories are one of the few examples in the world of an entirely flexible industrial building, one which can be adapted at will and almost at a moment's notice to allow for expansions or contractions of the departments inside. When the new blocks are added the external links will be as easily made as the internal adjustments. These are features of industrial architecture that are long overdue in this country, where company after company has surrounded itself with four solid walls, has planned its offices and workshops once and for all, and in next to no time has found the whole place out of date, too expensive to pull down, too costly to alter, a permanent, inflexible millstone round the accountant's neck.

At Welwyn they foresaw these dangers; their long experience in makeshift huts proved no doubt the value of easy flexibility; the vicissitudes of those huts must have contributed to the planning of the new blocks; one hut was certainly used as a guinea-pig for prototype benches, partitions and equipment.

A CORNER OF THE PHYSICAL TESTING LABORATORY. *The size of this room and the positioning of the benches have been tailored to the requirements of this section and could be altered again at will to suit a different type of research.*

It was thus early recognised that the maximum internal flexibility would be essential, that partitions between offices and laboratories must be quickly movable but that, whatever the internal rearrangements, laboratories must at all times be properly serviced by gas and electricity, compressed air or vacuum, water and drainage and any other raw material of scientific experiment that can be piped to or from a bench; the benches too must be as flexible as children's building bricks, arrangeable as an island here, as a peninsula there, or continuously round a perimeter.

This degree of flexibility pointed to three principles of design: standardised partitions related in size to standardised benches; standardised design for all services, so that alteration would mean nothing more than the addition or subtraction of standard parts; and standardised bench units such as tops, cupboards, drawers, sinks, fume hoods and desks. Such standardisation in turn pointed to what is called "modular construction"—the choice of a standard unit of measurement and its consistent application throughout the building.

The module at Welwyn was almost predetermined for the architect by the universal use of 'Holoplast' cavity panels for interior partitioning, exterior cladding and for the construction of all benches and fitments; these panels

THE CONFERENCE ROOM—*interesting and uncompromisingly modern with bent plywood chairs, folding table, large cantilever windows and grey 'Vynide' on one wall*

are made in 4 ft. widths. Thus the whole building is constructed on a 4 ft. module; all partition walls are multiples of 4 ft; the distance between the vertical stanchions is 8 ft., though apparently halved by the introduction of dummy mullions carrying the down waste pipes; and the services carried round the perimeter can be tapped for local connection at 4 ft. intervals. Thus benching and partitioning may be arranged to any design within the 4 ft. module, and in theory all services are available to any 4 ft. × 4 ft. area on all three floors.

In view of the great number of pipes, conduits and ducts required in a laboratory any solid form of construction such as steel girders and concrete or prestressed concrete beams would have caused obstruction; complete accessibility to the services at any point was essential. Only some form of open lattice construction, giving uninterrupted floor area, could provide this, offering as it does plenty of space to carry service pipes in beams and stanchions and cross-bracings. Thus at one point in its erection the building appeared as a dramatic skeleton, a sort of anatomical model complete with nerves, sinews and arteries but waiting for the flesh.

Now the flesh used at Welwyn was expensive. 'Holoplast' boards, for all their prefabrication and standardisation, are not cheap. It is possible that, in spite of increased steel tonnage, a traditional form of construction would in the short run have been more economical, but the decision turned on long-term convenience.

These panels and partitions can be removed and replaced with the minimum of site work, with no call for decorators to make good; alterations can be made virtually with a spanner and screwdriver. Furthermore, alterations to the internal planning of the laboratories were possible almost up to the opening day without impeding the construction programme; there is economy too in the fact that under the Welwyn system it is not necessary that every laboratory should from the start be equipped with every foreseeable service such as would be necessary under normal building methods; as a new service is required at some point it can be run in at short notice, for space is left in the service galleries and channels for extra pipes as they may be required. Thus flexibility postpones investment in services until they are actually needed.

(*Continued on page 284*)

The entrance hall

QUOITS

By Harry Hutchison (Nobel Division)

Quois is today played less and less. Here, before it is too late, camera and writer have recorded for us this ancient contest, dating back to the throwing of the discus in classical times. It is a game still popular in the mining villages of Scotland.

A FAMOUS QUOITING GROUND *in Scotland—Gracie's Bank at Annan in Dumfriesshire. Here play is going on in the Scotland* v. *England International last June. The quoiter is about to throw a metal ring weighing over 8 lb. to land beside an iron spike in the ground 21 yards away.*

"THIS is a great game," said Bing to me as we walked through Annan towards Gracie's Banking, where quoits is played more expertly than in most places nowadays. "But it is on the way out because too few young men are taking it up. Too much dancing and too keen on football. In a way that's a pity, because there is no better summer fun than quoits."

My guide was the late Mr. George Muir—"Bing" to friends in Nobel Division's Powfoot Factory. I could not have had a better introduction to the game. Bing was one of the most formidable players in the south of Scotland, and he last played for Scotland in 1938.

Quoits is simple in its rules but makes demands on the physical skill and qualities of the men who play best. The quoit is a ring of metal about eight inches across, with one flat side and the other side sloped from the height of the inner edge of the ring to level on the outer flat edge.

The flange of the quoit is about an inch across, and the total weight varies. There are no lower and upper limits for weight, but usually no player will throw with a quoit which weighs less than 8 lb. and very, very few believe there is any advantage with weights of over 14 lb.

Although throwing an 8 lb. quoit is not child's play, it is not a feat of great strength. Try it, however, for the first time, and it is very unlikely indeed that you will get the right flight and length. There is a knack and a supreme art in throwing it as easily as a champion.

What is a quoiting pitch? Few games have more simple land equipment. Any flat 25-yard square of land will do and give enough space for four separate matches to go on at once.

The range of each pitch from throwing lines to head is 18 or 21 yards. At each head an iron spike is embedded in the ground, and round that spike, either in a circle or in a square, is a pad of firm clay which is tramped level. The object of the game is to place the quoit in the clay, as near the pin as possible. There are rules for throwing. The quoiter brings his feet towards the starting mark for this 18 or 21 yard throw. He stands with his feet together swinging the heavy quoit in his right hand—or in his left if he is what the Scots call "Corrie-fisted." The arm holding the quoit is swept back almost to shoulder level as the quoiter turns slightly at the waist.

From this extended height at the back the quoit swings down easily at the end of the hand in a pendulum stroke and is caught in the free arm and brought up to the face in a sighting motion. When the thrower is satisfied that he has the weight, the swing and the rhythm correctly the quoit is released. The arm flows down from the backward position in a smooth arc, and as the quoit comes up the hand is turned flat with palm upwards and the disc is released with a slight spinning movement.

It goes through the air just like a miniature flying saucer. In this spinning path it will rise to a height of nearly twenty feet above the ground before dropping sharply with a squashy plop into the clay, where it should lie flat and embedded with its outside edge close against the metal pin.

No beginner can expect to place a good quoit in front of the pin. Most likely he will not release the quoit in the true flat spin which is needed for success. Often the disc will leave his hand in a vertical position and, instead of flying gracefully to the mark, will trundle sadly to a flat stop long before the patch of clay is reached. You must not do that in a quoiting match. In fact, the quoit must land fairly on the clay, and if any success is to be hoped for among experts it must rest in front of and against the metal pin. Otherwise the equally expert antagonist will place his quoit where you had hoped yours would go.

Bing told me that in a match where the men are fully skilled, victory can be decided by the first toss of a coin. That toss decides who will throw the first quoit. If the champion is in form he will place the quoit exactly where he wants it, which will probably be a "forewobber," just in front of the pin. A "backwobber" is a quoit which is slightly overthrown to land behind the pin and is not really as strong a shot.

Quoiting matches are played as singles or doubles. Usually the singles game is preferred, but the singles team contains

two members; the quoiter and his "paperer" or director. The director guides the thrower by placing a piece of paper in the clay and holding it vertically. This paper is an exact guide to the target. It tells the thrower where his director wants the quoit to go. Even the type of paper used must be carefully chosen. It must not be too soft but it must certainly not be too hard, because if there is resistance of any magnitude to the smooth passage of the quoit it may not land exactly on the spot.

The paperer is in every sense a member of the team. He is the man who advises his champion which throw to make. Whenever the quoit is thrown, the paperer who is squatting behind watches the flight, and as the flying saucer hurtles down towards the mark he dodges aside.

The quoiter, as enthusiastic as any bowler, follows the flight and runs towards the head. He is met half-way by the paperer, who runs towards him either to shake his hand in praise or pat his back in encouraging commiseration. This is unfailingly done.

Betting is frowned upon in quoiting matches, but side wagers are the rule rather than the exception. Round a quoiting enclosure the crowds may talk and countertalk between throws, yet when the business of sending the quoit from the line towards the head is being done there is silence. But between these moments of silence there is the excitement of the side bets.

"How is your man doing today ?" they will ask the paperer. "All right," he will reply. "£2 he doesn't make the shot"—and the bet will be either accepted or rejected.

In a keen match the worst thing that can happen is for two quoits to be so close to the pin that even with callipers the opposing directors cannot agree which is nearest. The method of measurement is simple enough. The winning quoit is the one which lies nearest to the pin. It is not necessarily the quoit which exactly circles the pin. The callipers measure from the edge of the pin to the nearest point on the quoit. Usually measurement is quite satisfactory to both paperers, but sometimes there can be great doubt and a referee is summoned to arbitrate.

THE QUOITER IN ACTION *just after throwing*

AN ALLY OF THE QUOITER *is the paperer, who tells the quoiter exactly where to aim*

Quoiters hate this calamity. It means that five or ten minutes are wasted while the judge makes his decision.

Only he, for example, can extract a quoit from the clay, and his decision about nearness to the pin must be accepted. Meanwhile the quoiters have been cooling and their lax muscles have become stiff. Restart of play is like beginning a game with a serious difference. Each player must start where he left off, and no practice throws are allowed. Sometimes after a near end which has needed measurement a quoiter will be so off rhythm that he will not be able to throw well for the rest of the game.

Nowadays quoits are comparatively hard to buy. With decrease in popularity of the sport among young men, established quoits manufacturers have gone out of business in Scotland. If a man wants to start nowadays he must either buy from one of the few manufacturers left, or from some older chap who is giving up quoiting. The equipment is one pair of quoits, and these are bought at approximately 6s. per pound weight.

If, therefore, you are starting with 8 lb. quoits you will pay 48s. each for them. If you find that 8 lb. is too light for you there is no need to be alarmed, because round the circumference of the quoit there are half-inch holes drilled. These holes are for taking lead, which gives added weight and balance.

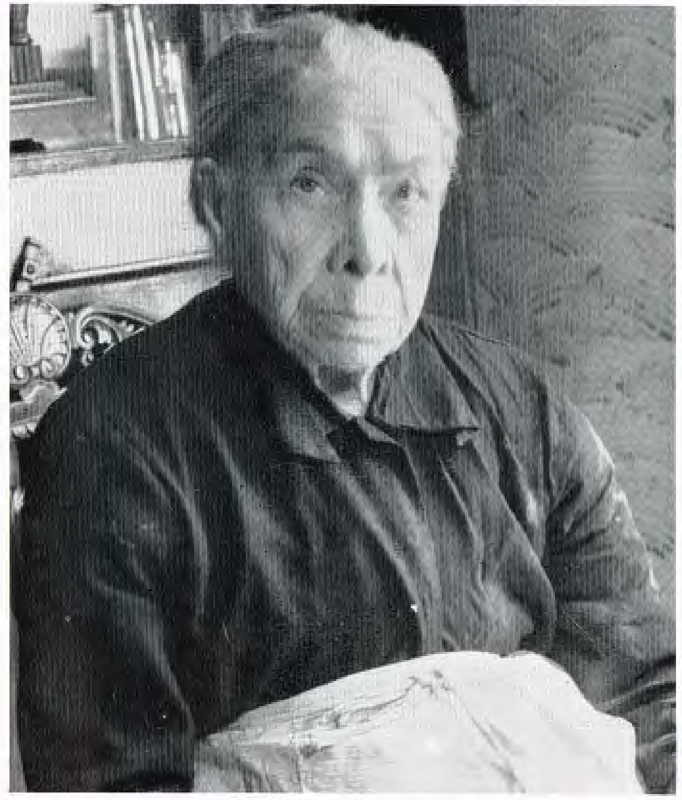
An old quoiter I know has often told me that probably the outstanding match of all times was played during the siege of Troy. It is a good story, for similarities between throwing the discus and quoiting give some substance to his claim. Discobolus, they say, would have made a nice quoiter in an International.

I.C.I. NEWS

THE OLDEST PENSIONER

On 5th July a letter from the trustees of the I.C.I. Workers Pension Fund was delivered to 87 Pembroke Street, Islington. It brought to Miss Mary Crouch their congratulations on a momentous occasion—her 98th birthday.

Miss Crouch is now I.C.I.'s oldest pensioner. She was employed at the Edmonton factory of Eley Bros. until 1920 and has lived in Islington for all but two years of her long life. She still enjoys good health, apart from failing eyesight and occasional spells of dizziness which prevent her from going out and about as much as she would like.



Miss Mary Crouch

HONORARY DEGREE FOR SIR ARTHUR SMOUT

When Sir Arthur Smout, a former I.C.I. director, received the honorary degree of LL.D. at the University of Wales in July, he was described as "a man who achieved eminence the hard way but whose generosity and vision had made it easier and swifter for those who follow him."

The degree was conferred on Sir Arthur in recognition of his work for industry in South Wales and his contribution to technological education. "In honouring him," said the Principal of the University, "we honour the great undertaking which has provided so many I.C.I. fellowships at universities in this country through Sir Arthur's personal solicitude and mediation."

I.C.I. RIFLE LEAGUE RESULTS

The tie shoot between Mr. A. D. Skinner of Kynoch Works and Mr. G. Hartley of Billingham resulted in a win for Mr. Skinner that will earn him the hearty congratulations of all I.C.I. Rifle League members. He scored a "10X possible"—each shot cut the inner dotted line—and therefore wins the Division I aggregate medal without dropping a single point.

The Handicap Trophy, judged on the average score made in each round of the league during the past season, has been won by Kynoch C team. They made a gun score of 492 against an average of 479·8, giving them a total of 500·545. Following them quite closely was Cassel Works B team, whose gun score of 475 against an average of 461·7 gave them 500·325.

ALKALI DIVISION

Mid-Cheshire Bowls Champion

A Wallerscote Works employee in the news is Mr. Walter S. Lowe, a plumber in Area 6. He added another victory to his already long list of bowling successes when he won the Guardian Bowls Cup Competition—the individual mid-Cheshire championship—at the end of July. The competition attracted 284 entries from many parts of mid-Cheshire, and Mr. Lowe had nine games to play before reaching the final eight. As well as winning the handsome silver Guardian Cup for twelve months, he was also presented with an eight-day Westminster chiming clock.

Mr. W. S. Lowe

Although this is the first

Left: Mrs. A. E. J. Gawler cuts the tape at the official opening of the new waterworks plant at Magadi. Right: The new supply of water was soon being put to good use.

time that Mr. Lowe has won this particular competition—he reached the semi-final in 1950—he is a very experienced competition bowler. He recently played in the semi-final of the *Evening Chronicle* Bowls Competition in Altrincham, only to be narrowly defeated.

He is very well known in Cheshire bowling circles as a member of the Winsford Liberal Bowling Club, for whom he bowls regularly. He has been selected to play for the county twelve times since 1939, when he played against Yorkshire at the age of 26 and was the youngest member of the team. His most recent game for Cheshire was at Birmingham against Warwickshire. He has lost only three of the games he has played for the county, and these have all been by a narrow margin.

A confident and consistent player, Mr. Lowe's genuine enjoyment of the game is evident in his play. Despite all the practice he puts in at bowls, however, he still finds time to play an occasional game of snooker.

A Great Day for Magadi

In June Mrs. A. E. J. Gawler, wife of the chairman of the Magadi Soda Co. Ltd., officially opened a new waterworks plant at Magadi. The plant will supply Magadi employees of all races with water for drinking and all other purposes.

The water is brought by pipeline and gravity feed from the river Oloibortoto some twenty miles to the west of Magadi; the successful laying of this pipeline, under conditions which have at times been difficult, is no mean achievement. The opening of the completed plant, therefore, was wholeheartedly celebrated by all members of the colony together with their guests.

Water through the pipeline actually reached the settlement at the end of March, and while the treatment plant was being finished some of the overflow of water was directed into the salt ponds of the old salt plant, making a paddling pool for the children; they took to it like the proverbial ducks and thoroughly enjoyed their new-found pastime.

A Gift to Canada

At the end of July an oil painting of Winnington Hall was dispatched to Canadian Industries Ltd. at Edmonton as a gift

from the Alkali Division board of directors. The gift commemorates the starting up of the new polythene plant at Edmonton.

The artist commissioned to execute this painting was Mr. James Bateman, R.A. In the photograph above he is seen making his preliminary sketch of the Hall from the grounds, with part of Winnington Works in the background.

Winnington Hall, once the home of Dr. Ludwig Mond and Sir John Brunner—the co-founders of the Division—was the birthplace of the ammonia-soda industry in Britain. It is now used principally as a guest house for visitors to the Division, and it was here that the C.I.L. chemists and engineers stayed when first they visited Winnington to get the know-how of making polythene.

In addition to the painting, two framed photographs have been sent to C.I.L. The first one shows the main approach to the polythene plant at Winnington; the other the Research Department of the Alkali Division when polythene was discovered twenty-one years ago.

BILLINGHAM DIVISION

Firemen break Record

A team of full-time firemen from the Billingham factory broke all Durham County records for the event when they won the light trailer pump contest for industrial brigades at the Durham County Fire Brigade's annual display and drill competitions at Durham on 10th July.

Trained by Mr. M. Haylock, the factory's chief fire officer, and only the second Billingham team to take part in county competitions, they were Chargehand Fireman Norman Hindmarsh and Firemen Bert Albrecht, Edward McCann, Leslie Huddlestone and William Myers.

Competing against ten other industrial teams from all parts of the county, they had to jump from their van, remove the blanking cap on the pump, fix two lengths of suction hose, connect and run out a delivery hose, and knock down a target with a jet of water. To complete the test the team had to disconnect and reel up the hose, refix the cap on the pump and have everything cleared away before getting back in the van.

They did all this in the semi-final of the competition in only 45 seconds, a much better time than any achieved in previous Durham County contests for this drill, and in the final they did it in $52\frac{2}{5}$ seconds, despite the almost waterlogged condition of the ground.

Their semi-final time was more than six seconds faster than the best returned by a professional team in a similar event for county brigade crews.

Biggest C.D. Exercise at Billingham Factory

Incidents staged in the Billingham factories to simulate the effect of bombing were part of the largest Civil Defence exercise held there since the war.

On the assumption that the factories' own Civil Defence teams had been overwhelmed in an attack, the experimental Civil Defence mobile column, which has been training in the north-east, was brought in and they handled sixteen incidents widely dispersed throughout the factory.

A "casualty" is brought out of the wreckage during the Civil Defence exercise at Billingham

In a speech afterwards, Mr. E. A. Blench, Division production director, who is in general charge of the Civil Defence organisation in the factory, indicated some of the points the exercise had emphasised.

Mr. G. Hutchinson, Home Office Principal Regional Officer, who with county officials had watched the exercise, described it as excellent and very successful.

The only part that members of the factory organisation took was as guides, wardens and umpires, and the incidents were arranged by the Division Safety Department and staged by factory personnel under their guidance.

The Mobile Column has its headquarters in the south of England and has been touring the country. A full-time organisation composed of National Service men and commanded by Brigadier D. A. L. McKenzie, it consists of eighteen specially equipped vehicles for rescue purposes and has its own detachment of despatch riders and motor-cycle police.

This Civil Defence rescue team from Billingham is the best in County Durham. At Sunderland on 27th July they won the final of the county competition by scoring 251 marks out of a possible 300. Later they will compete with the champions of three other counties in the semi-finals of the Northern Region competition.

For the exercise it was split into two sections stationed in different parts of Billingham and was sent to the factory after a call for assistance had been sent to Billingham Urban Council's Civil Defence organisation.

The exercise, which lasted nearly three hours, was designed to test fully the whole technique of rescue work. There was straightforward digging to release casualties from heaps of rubble, and one team had to release the occupants of a heavy concrete shelter that had been overturned and had its door jammed.

In the coal washery, casualties were trapped well below ground, and as it was assumed that all the steel girders and ladders had been destroyed, the team had to use their own extending ladders and then erect a boom for a pulley and ropes in order to bring the casualty up on a stretcher.

Close by was another incident in which a casualty had to be lowered from a height.

In other parts of the factory conditions that would arise if there had been escapes of acid and gas were assumed, and rubber gloves and gas masks were used by the teams.

In Casebourne Works there were two well-staged incidents, in one of which jacks had to be used to raise heavy beams before releasing a casualty. In the other, staged in the raw mill house, there was complete darkness, and as it was assumed that the electricity supply had been cut off emergency lighting had to be used.

The work of the teams was co-ordinated by officers using Land Rovers, and Mr. G. S. Turner, the factory Civil Defence officer, moved from one incident to another and reported progress to Safety Department by means of walkie-talkie radio.

Referee honoured by County

Looking back over the many years he has been interested in sport, both as a player and an official, Jimmy Eden, a material clerk in Workshops Central Office, sometimes wonders how he has ever had the time to do his job, take an interest in his home, a garden and an allotment, and so much sport as well.

Mr. J. Eden

Now his long interest in football has been recognised by the award to him of a certificate by the Durham County Society of Association Referees for meritorious service extending over 29 years.

These certificates have just been awarded for the first time locally, and Mr. Eden is one of several in the district to receive one for more than 15 years' service.

He is more than 60 but does not look it, and his interest in sport continues unabated. During Navy service he played football, cricket and water polo. He became a soccer referee in 1922 but gave up active refereeing in 1938. Since then there have been many referees who have learned by his experience, for he has been coaching in the Stockton area for the past seven years.

He is appointments secretary for Stockton Referees Association and is responsible for appointing referees for matches in a wide area north of the river. He is also a vice-president of the Association and audits its accounts.

In local cricket he is well known as an umpire, but he played for many years and in turn has been captain of Synthonia's fourth, third and second teams. Then his interest turned to management, and as section secretary before Mr. W. Bielby took over he had much to do with the start of the Fleck Trophy competition.

In Workshops his interest continues, for he organises all the sporting activities of the social section, and he is a member of the Synthonia Club Executive Council.

METALS DIVISION

Dr. Gideon Sundback

The news of the death on 22nd June of Dr. Gideon Sundback, the inventor of the modern slide fastener, was received with deep regret.

Dr. Sundback was born in Sweden in 1880 and emigrated to the United States in 1903. An electrical engineer by profession, he joined the Automatic Hook and Eye Company in 1906. This concern was struggling with little success to produce a fastener which would work and which could be produced commercially. From the moment he joined the company Dr. Sundback gave his whole time and energy to developing what was at that time regarded as a novel gadget. His early attempts to produce a practical device were unsuccessful, but he was a man of unflinching courage who had been appointed for his stubborn and bulldog tenacity to follow through with an idea.

This description proved to be fully justified, for by 1913 he had invented and perfected the first successful slide fastener, and, what was more important, an automatic precision machine to produce fasteners in quantity. By the end of the first world war the "hookless" fastener was well launched in the United States.

In 1919 Kynoch Ltd. purchased the extra-United States patent rights from Dr. Sundback, and from that time until his death a close association was maintained between Dr. Sundback and Lightning Fasteners Ltd. and its subsidiaries.

Dr. Sundback was a vice-president of the U.S. Talon organisation, the world's largest fastener manufacturers, and president of two other subsidiary companies. In spite of his wide interests in the United States he gave his time and knowledge generously elsewhere, and I.C.I. has reason to be grateful to and mourn the loss of a great inventor and trusted friend.

"Our Emma" takes the Air

As a Viking aircraft left the ground at Blackbushe airport on 24th July Miss Emma Middleton, B.E.M., unfastened her safety belt and settled back in her seat with all the tranquillity of a seasoned air-traveller. Nobody would have guessed that, at 69 years of age, she was taking her first flight and her first trip abroad.

Miss Middleton, who became known to everyone in the Sporting Ammunition shops at Kynoch Works during her 45 years' service as "Our Emma," had come out of retirement to join a party of some thirty I.C.I. people (twenty-seven of them from Witton) who flew to Nice in the South of France for a fortnight's holiday. By joining forces for this holiday they were able to afford a special charter aircraft for the journey there and back.

Miss Middleton (tenth from left) with the I.C.I. party which flew to the South of France

The flight, which took $3\frac{1}{2}$ hours, was a new sensation for many of the holiday-makers besides Miss Middleton. Her friend Miss Lily Davidson, works councillor for the Kynoch B Sporting Ammunition factory, was also making her first flight and her first journey abroad. Miss Davidson's 79-year-old father enjoyed every minute of the novel experience.

The party stepped from the aircraft, which had left England in a drizzle typical of this summer, into a blazing Riviera evening. With the temperature in the 80°'s, they discarded their overcoats even before reaching their hotel. "It's a bit different from England, isn't it!" said "Our Emma." "I can't think why I never came here before."

An Excellent Idea

Mr. T. Young of King's Norton No. 3 Factory submitted an idea to the Suggestion Scheme which resulted in his colleagues gathering in the Inspection Department on 23rd July to see him presented with a cheque from the Company for £100.

After Mr. C. Allday, the factory manager, had referred to the simple but ingenious proposal put forward for improving a furnace process which had since been tried out and found to work as well in practice as in theory, Mr. S. S. Smith, the Division research manager, expressed his gratification at the obvious thought which had gone into the working out of the suggestion and then presented Tommy Young with his award. The recipient quietly expressed a hope to be "coming up more regularly."

Concluding the ceremony, Mr. W. R. Taplin, the Division Suggestion Scheme secretary, said that while such large awards were not of everyday occurrence there was almost no limit to the amount which might be won for a suggestion related to effecting economies in production or improvement in the quality of a product without extra cost.

NOBEL DIVISION

Barges in Thames and Medway Races

The Division was represented once again in the Thames barge sailing race this year. Last year's race was to have been the last, but public interest in the barges has grown so much that it has been revived.

Dreadnought and *Revival* were entered from Denton Wharf, as before, and in bright sunshine and a smart breeze *Dreadnought* came second in the restricted staysail class. Only misfortune in the shape of a buckled crosstree, which meant taking in the topsail, robbed her of a handsome lead over the eventual winner.

Dreadnought and *Revival* were also entered for the Medway sailing barge race, and in the staysail class *Dreadnought* finished first and *Revival* third. Unfortunately a technical objection was lodged against *Dreadnought*, which was disqualified, *Revival* moving up to second place.

PLASTICS DIVISION

Twin Trouble

A certain amount of confusion is being caused in the nether region of the Restaurant at Black Fan Road, Welwyn, by the presence of the Eldrige twins, who are training as cooks. Gloria and Sybil are so much alike that only now, after twelve months, can the chef tell one from the other. Should Gloria leave a task unfinished Sybil gets the blame, and the reverse is sometimes true when praise is offered for a job well done!

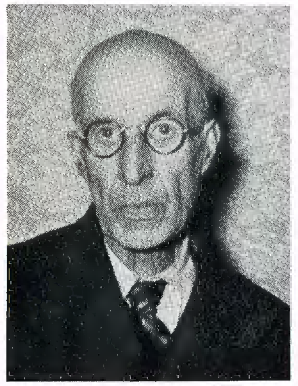
During the term of training the twins have to do all the jobs in turn, from pot-scrubbing and potato-peeling to cake-making, and it becomes difficult when allocating the chores to ensure that a double dose of floor-scrubbing is not given to either of them.

The twins are 16 years old, and they were the first twins to be born in Welwyn Garden City. Sybil claims to be older by two hours. Both like their present work and are keen to make progress in their branch of catering.

The Eldrige twins of Welwyn. The problem is, which is which?

Recipe for Old Age

"Never drink tea with meat" is the recipe for attaining old age given by Mr. Arthur Begent. Mr. Begent should know, for he has just retired from work at Orchard Mill, Darwen, at the fine old age of 82.



Mr. A. Begent

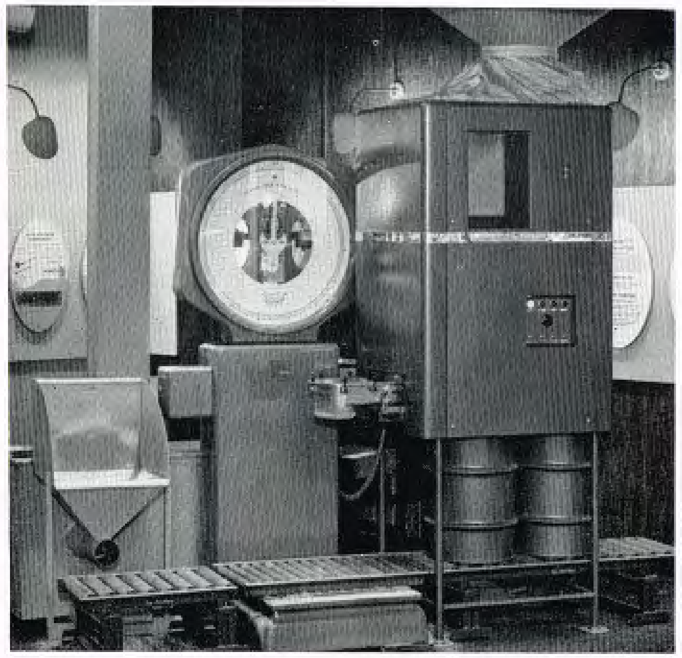
Mr. Begent had been with I.C.I. for eleven years—he began work at Orchard Mill as a maintenance fitter during the war at the age of 71. He is not one to pine after the "good old days." In all his seventy years of working life, he says, conditions have never been as good as they are now; and more than any other time he has enjoyed his eleven years with I.C.I.

Mr. Begent has recently undergone two operations in hospital, but he is now up and about again.

New Machine means Easier Weighing and Filling

An entirely new type of automatic weighing and filling machine, invented by a team of Plastics Division engineers and now being produced by the British Tabulating Machine Co. Ltd., is expected to revolutionise weighing and filling methods in industries ranging from plastics to brewery. Not only does it allow containers to be filled automatically with complete accuracy ($\pm$ 0·1% has been achieved in trial runs), but it automatically prints a record of what it is doing: net weight of material poured into each container, batch number, serial number of container, and the total throughput at the end of each batch.

The need for such a machine has long been felt in Plastics Division, where the accurate weighing of such costly products



"Plastab," the automatic weighing and filling machine invented by Plastics Division engineers

as P.T.F.E. is of importance; an order delivered underweight can be an embarrassment, while overweight delivery can be very expensive. The Engineering Department was called in to solve the problem, and their research, in which they were helped by electronics experts in Nobel Division, resulted in a new machine which surpassed by far the original requirements.

One source of error in filling containers, they found, was in the operation known as taring—balancing out the weight of the container. All too often the variations in weight of individual drums were not accurately allowed for, resulting in errors as large as 1 lb. in 14 lb. The new machine automatically allows for the weight of each container before filling it, and therefore rules out that source of error.

After weighing the drum the machine automatically starts to feed in material. By means of a simple optical arrangement which includes a photo-electric cell, the rotation of the indicating pointer generates a train of electrical impulses. The pulses are counted by an electronic unit, and when this reaches a predetermined value the coarse feed shuts off, leaving a slow trickle of material. This in turn is shut off at another preset figure. When the machine has come to rest the total number of pulses, representing the net weight filled, is relayed to the printer, which prints the information. The filled drum moves on, and the whole machine is ready to start a new cycle of operation.

'Plastab,' as the machine is called, will not only mean less trouble for men filling containers; by creating its own records it will eventually cut out much office work. Its inventors (the team of engineers was headed by Messrs. A. Kennaway, R. A. Lolley and O. R. Pigott) think it is an important step forward to the completely automatic factory.

SALT DIVISION

New Managing Director

Mr. E. H. Sale, who as chief engineer has been a member of the Division board for four years, has been appointed a managing director of the Division. He will retain his post of chief engineer.

Mr. E. H. Sale

Mr. Sale joined the Research Department of Synthetic Ammonia and Nitrates Ltd. in 1925, two years after leaving Cambridge. Then for thirteen years he was engaged at Billingham on various jobs of plant maintenance, design and research, and in 1939 he became deputy works engineer of Ammonia Works.

During the war years Mr. Sale was the works engineer at the M.A.P. factory at Heysham which produced vital supplies of aviation spirit. After the war he was closely associated with projects such as the new nylon plant at Billingham and the petroleum cracking plant at Wilton.

He joined Salt Division from Billingham in 1950 as chief engineer. Since then he has been responsible for the modifications and extensions to the vacuum salt plants at Stoke Works and Weston Point, and he has prepared the way for the reconstruction of Weston Point Works. In addition some unforeseen

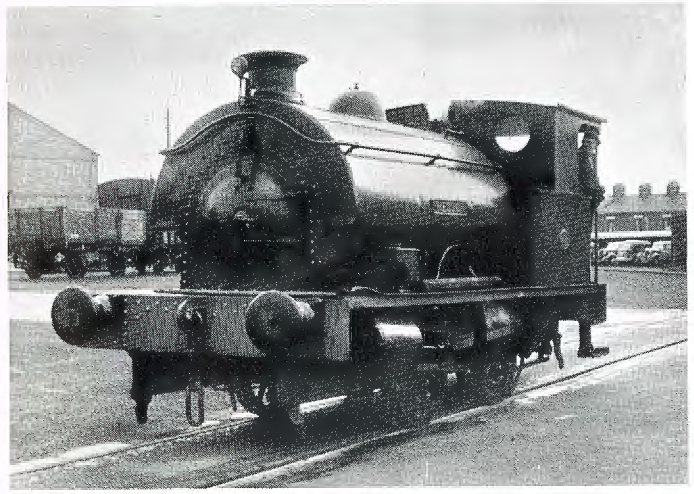
problems have fallen his way, such as the sinking of the two new boreholes at Carrickfergus Works in Northern Ireland after the brine supply was lost there in November 1952.

Mr. Sale is a keen sportsman, and until he left Billingham in 1950 he played hockey occasionally for County Durham. When he can find the time he still plays golf, tennis, badminton, cricket and bridge and is interested in walking, climbing, ski-ing and potholing.

Fifty Not Out

Weston Point Works was celebrating in July the fiftieth birthday of a stout, fussy and slightly wheezy old party called *Weston*—a locomotive built in Newcastle in 1904 and still going reasonably strong for her age.

There is no record of the exact date on which *Weston* started work at Weston Point, but she was in the hands of one



Fifty years old: the locomotive Weston *of Weston Point Works*

driver, Fred Sadler, for thirty-two years. The present crew—Jim Antrobus, Desmond Fish and Jim Simcock—are doing their best to ensure that *Weston* lasts for at least another half-century.

A.E. & C.I.

Spare-time Flyers form own Club

A group of keen flyers at the Somerset West factory of A.E. & C.I. have formed their own flying club—the Hottentots Holland Flying Club. The twenty-six members (seven licensed pilots and nineteen learners) have their own Piper Cub aircraft, which they fly from the nearby Eerste Rivier airfield.

The idea of forming the flying club originated with three ex-South African Air Force men at Somerset West: Charles Humphreys, John Weaver and Leon Steyn. Having formed the club, their next problem was to find an aircraft. A Piper Cub was eventually located at Loeriesfontein, and one of the keenest members, Dr. H. E. Spencer-Payne, bought it for the club.

Their next problem was to find an airfield. Eerste Rivier, an abandoned military field, was handy, but the authorities were reluctant to hand it over. The club solved this difficulty by inviting four members of parliament to become honorary vice-presidents. All four accepted (they were Sir de Villiers Graaf, Dr. Otto du Plessis, Mr. H. Oppenheimer and Mr. C. V. de Villiers), and Eerste Rivier became the club's. Mr. de Villiers has since started flying instruction with the Hottentots, and is now known as the flying M.P. for False Bay!

Members are allowed to fly at cost price until they have qualified for their private pilot's licence, which requires a minimum of forty flying hours. The club claims that half an hour's flying instruction a week, on these terms, costs a member no more than his cigarettes for a week.

Having surmounted all the initial difficulties, the club has now run into a fresh problem. Membership has grown so fast that already another aircraft is needed.

I.C. (PHARMACEUTICALS) LTD.

I.C.I. Locos go on Record

A recent series of three articles in *The Locomotive, Railway Carriage and Wagon Review* has recorded for posterity some of the technical niceties and curiosities of I.C.I.'s 138 railway locomotives. The articles are by Mr. S. Ellingworth of I.C.(P), who has been a railway enthusiast since his early childhood and is now an acknowledged authority.

Mr. S. Ellingworth

Mr. Ellingworth found much of interest to record as he toured the 300-odd miles of I.C.I. railway tracks, and made one discovery that caused an appreciable stir in the railway world. At the Kynoch Works of Metals Division he found a unique Ramsbottom locomotive built in 1865; it was thought to be of such historical interest that it was recently presented to the British Transport Commission for preservation.

Mr. Ellingworth found other ancient locomotives at the Winnington and Lostock Works of Alkali Division: a "stud" of 0–4–0's built to a design which originated in the 1880's. One of them, *Faraday*, was built in 1891 and is still going strong, although it has acquired an anachronistic touch in the form of radio-telephone apparatus.

By way of contrast, another I.C.I. "sole example" is of a design relatively modern in its conception. This is a 0–4–0 of the fireless type, built by Hawthorn Leslie & Co. in 1930, which operates at the Huddersfield Works of Dyestuffs Division in areas where inflammable materials are handled.

Mr. Ellingworth also mentions some of the Company's twenty diesel locomotives. Wilton is likely to become I.C.I.'s chief diesel stronghold, for this form of traction has been adopted from the outset of the factory's operation. At present two 350 h.p. 0–6–0 diesel-electric locos are at work there. Other diesel-electrics are located at Winnington and diesels with mechanical transmission at the Ardeer Factory of Nobel Division.

The steam locomotive *Castner* employed in marshalling and hauling trains between the Runcorn Works of General Chemicals Division and the L.M.R. main line is cited as one of the

most compact and powerful shunting locomotives in use in British industry. Weighing 60 tons, it is considerably more powerful than many main line freight locomotives.

Mr. Ellingworth's passion for railways has no connection with his job: he is a scientist, and has been associated with the Company's pharmaceutical enterprise since its inception in 1936. Nor would it give you a clue to his other spare-time pursuit, that of playing the organ. He has been organist at St. Paul's Methodist Church, Didsbury, for nearly twenty years; he gives recitals locally from time to time; and although he originally taught himself to play, even Bach's fugues hold no terrors for him now.

I.C.I. (EXPORT) LTD.

The Case of the Missing Penny Red

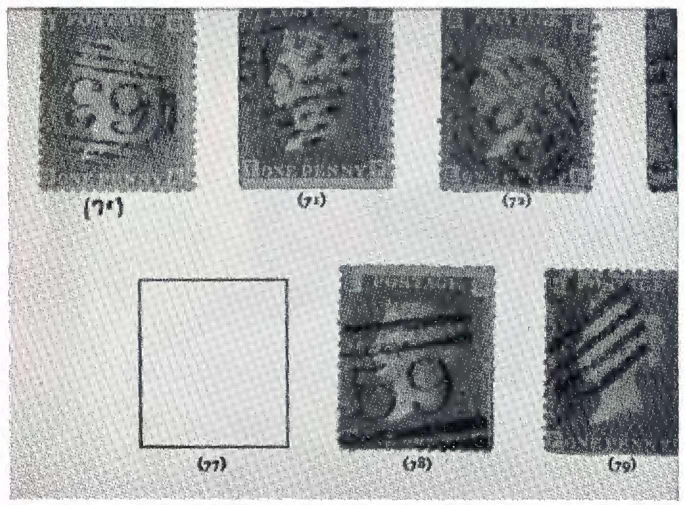
Reading the May issue of the *Magazine*, Mrs. Daw Hla Tin, who works for I.C.I. (Export) Ltd. in Rangoon, came on the article "Philately Philanderings." As she came to the second page of the article she glanced casually at the illustration at the top of the page of some Victorian Penny Red Stamps. Then she looked more closely, and as she read the caption her heart gave a jump: "The stamps here are worth only a few pence to a few shillings each, but plate No. 77, which is missing, is catalogued at £300."

She remembered her own Victorian Penny Red. Queen Victoria's head faced the same way as in the others shown. The word "Postage" was printed at the top and the words "One Penny" at the bottom. A capital letter A was printed at all four corners. But was it the missing stamp?

Mrs. Daw Hla Tin hurriedly wrote off to the *Magazine*, ending her letter "I shall be much obliged if you will inform me whether there is any likelihood of the stamp in my possession being the missing No. 77 shown in the block."

A reply went back at once, containing advice from Mr. F. G. Stevens, author of the article. He advised Mrs. Daw Hla Tin to look first for the number 77 in the side margins of the stamp, warning her that 177 was often mistaken for 77. Secondly, only a perforated stamp could be the missing one.

There, for the time being, the Case of the Missing Penny Red rests. Mrs. Daw Hla Tin's stamp may be worth £300; on the other hand, it may be worth a few pence. Until she writes to the *Magazine* again the story will have to remain, like all the best adventure stories, "to be continued in our next."



The missing stamp, worth £300, may be in the hands of a reader of the Magazine *in Rangoon*

* * *

OUR NEXT ISSUE

September 14th is the fifth birthday of Wilton Works, and the *Magazine* is celebrating the occasion by devoting five and a half pages to colour photographs of Wilton. The photographs have been chosen to give as far as possible an impression of how attractive can be a modern chemical works spaciously laid out with all service piping below ground level. A short account of Wilton's progress to date is written by the Editor.

In the same issue we have another rather unusual feature in that we are publishing three cartoons on public speaking drawn by Maureen Harding when she worked in Work Study Department. Mrs. Harding was employed there as a draughtswoman up to June last year. Our final article is an amusing little short story—which the authoress insists is a true story—about the adventures of a stray spaniel called Mr. Ecks. It has been sent in from Hillhouse Works, General Chemicals Division. The story will be illustrated by Martin Aitchison.

Holiday Competition

In response to requests, the closing date for the Holiday Competition for articles has been extended to 18th October.

WELWYN PIONEERS NEW LAB *(continued from page 272)*

Flexibility also makes possible the direct participation of the scientists in the planning of their place of work; each head of a laboratory was allowed to plan his own area, site his own benches and offices and divide up his space (always in terms of the 4 ft. module) to suit his particular programme; and if he finds a mistake in his planning it can be put right in a matter of hours. Similarly the offices in the administrative wing can be expanded or contracted as occasion arises.

A minor but important feature of this flexibility is an ingenious system of lighting control exchange panels whereby any group of lights can be controlled from any door switch; if you alter a door position or break up a large area into small rooms the lights can always be switched on at the door, wherever that may be.

The general atmosphere of the interior is, of course, one of lightness; the laboratories are lit continuously by large 4 ft. wide windows separated only by the vertical stanchions and ducts; in strong sunlight, Venetian slatted blinds can be lowered between the double window glazing; the ceiling lights are mainly fluorescent tubes in opal 'Perspex' troughs; the 'Holoplast' partitions are stove enamelled white; the floor is of ruddy mottled p.v.c. tiles patterned to correspond to the module lines; the standard benches are topped with hardwood veneers on 'Holoplast' boards and fronted with pale blue-grey Formica panels, giving throughout a clean, modern effect that is unhappily broken, particularly in the offices, wherever dingy old furniture from some previous incarnation is interpolated—a small point of criticism but a classic example of halfpenny wisdom in a handsome new ship.

A Morning In The Train

By Ellen Jacobus (Birmingham Area Office)

THREE years of travel, constant journeying back and forth between a small country town and a great city—three years of watching the clock and wondering which would be the last possible second to leave either home or office and still manage to board the object of my connection between two worlds, both so antithetical.

But what of the time spent in travel? What things does one see and learn? Whom does one meet? Therein lies the object of my writing, to paint a picture of my fellows who also pay a large part of their wages to British Railways. Let me describe a carriage one morning during the week and how it all appears to me.

Three people sitting—a young girl, a rather pretty girl, in one corner; opposite her, occupying another corner, a middle-aged businessman with face obscured by the *Daily Telegraph*; and next to him his travelling companion, feeling perhaps more inclined to fix his early-morning thoughts on the puffing of his pipe than a newspaper. The Girl wonders whether to continue knitting her jumper, read the next instalment of a heart-rending serial in *Woman's Own*, or just sit and survey the back pages of the *Daily Telegraph*. In fact she decides that the fumes from the pipe are becoming too much for her, and she lets down the window a little, anxiously surveying the two opposite in case one of them might complain of a draught; but the window episode attracts the attention of neither the Reader nor the Smoker—at least, not noticeably.

However, the Smoker, when he no longer feels the eyes of the Girl upon him, and when he notices that she has started to read the serial, begins to remove his thoughts from the pipe and surveys the Girl. "Probably a secretary. . . . Probably sounds very prim over the telephone. . . . Probably get married before long. . . . These girls are all the same." Then swiftly his eyes dart to the

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window as the Girl, who has reached a rather naughty part in the serial, raises her eyes to see if anyone might be mind-reading. Deciding that all is well, and no one could possibly guess how she was enjoying that bit, the Girl reverts to the serial.

A page of the *Daily Telegraph* has been read—at least, all that is worth reading—and now the page must be turned. This is regarded as a propitious moment by the Smoker to say a word to his intellectual friend, and he remarks upon the fact that the reservoir seems ruffled this morning, and it will probably rain. Agreeing that it probably will, and at the same time turning the paper, the Reader, Smoker and Girl are all interrupted as the train stops, the door is opened, and four intruders burst in upon the little community.

The Girl is anxious in case she might have to remove her knitting bag so as to make more room, the Reader carefully pulls his highly polished feet close to the seat, and the Smoker continues to puff. At last everyone is settled again, and for a few seconds the intruders examine the occupants, and vice versa. (The Girl, by the way, was relieved to find that she did not have to remove her knitting bag from the seat.)

The four newcomers consist of a young man, obviously rather proud of his recently grown blonde moustache, a schoolboy with rather a lot of pimples on his face, an elderly and very plain-looking spinster, and—much to the annoyance of the Girl—another pipe smoker! The window has, of course, been put up again by the last person who entered the carriage, but the Girl is brave, and she has the courage to let it down again—this time a hole lower.

With a sigh she again brings herself back to the hero and heroine of her book—Roderick and Euphemia. A page now having been turned, a full-size picture of Euphemia in Roderick's arms can be seen by all whose eyes are attracted by the vivid yellow sweater in which the artist has clothed Euphemia.

The Spinster happens to be next to the Girl, and has begun knitting what appears to be a plain sock, which is most convenient really, as it enables her to study the others and listen to any conversation which might be going on. She is the first to see the picture of the beautiful Euphemia. Having decided that it is not worth the effort of putting on her reading glasses to see what it says under the picture, she contents herself by thinking how empty-headed the younger generation are, and that if she had her way such literature would never be allowed to be published. And as her needles click faster, she goes on to tell herself that what is needed is more women in Parliament.

The young man is the next whose eyes see the large splash of yellow in the magazine, but it is a little more difficult for him to see, as he sits next to the Smoker, opposite the Girl. He has quite a good look at the Girl, starting from her legs, which he decides are rather neat, and finally sums her up as not a bad-looking piece; in fact he even wonders what it would be like to take her out.

The Girl suddenly shuts the mazagine, for she feels that perhaps the Spinster might be reading some of it too —after all, the boss was going out later on and she could have a more private read then. Her eyes encounter the gaze of the young man, who then produces the *Financial*

. . . a carriage one morning during the week and how it all appears to me

Times behind which to hide his guilt. The Girl thinks he looks rather young, and decides he is probably conceited. She decides that he might look a bit better without that silly moustache, and she wonders what he would think if he knew what she was thinking—and he wonders what she would think if she knew what he was thinking.

The Schoolboy is beginning to feel the draught from the window, but would rather die than say anything. He is doing his geography homework and reading about the methods of irrigation used in the Nile Delta, but strangely enough, though his eyes are reading the words, his mind is thinking of that wonderful day when he would be Britain's chief test pilot. These other people, he thinks, do not know that there is one among them who will be famous in ten years' time. Gosh, then they would all want his autograph!

The train whistles as it enters the tunnel, the *Daily Telegraph* and the *Financial Times* are folded, the knitting and geography book are put away, tickets are produced and . . . *nous voilà arrivés*.

Fountains Abbey, Yorkshire

Photo by Miss R. Higginbottom (Leathercloth Division)